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that of Professor Agassiz, who has examined and compared the one with the other. I would add that my conjectures as to the new species being found at the terminus of the tide in the tributaries of the Delaware river have proved correct; as I have since ascertained that it is taken in March in the Brandywine below the dam at the head of tide, as well as at the foot of the rapid water at Trenton, appearing for a short time before spawning and apparently only for that purpose.

My object in this communication is to establish this as a distinct fish and give it a specific appellation, as well as to settle any question of priority of description which may hereafter arise.

I have presented this evening a small vial which holds the contents of the stomach of a northern smelt, *O. viridiscens*, as being suggestive of the vast amount of fish food accessible to marine species in winter as well as in summer. The vial contains three shrimps, one of the small fry of some other fish, and a half dozen fish ova not quite as large as those of our brook trout. The ova have made no progress in the process of incubation, from which I infer that they were seized by the Osmerus as soon as they were ejected, or not long after they were deposited by the parent fish. In observing the habits of both species above referred to, I have found them to go to the head of tide, but no further, for the purpose of spawning. This occurs as soon as the rivers are free from ice in the spring, when the northern smelt is taken in such numbers from the Gulf of St. Lawrence as sometimes to be used as manure.

Description of Nine Species of UNIONIDÆ from Lake Nicaragua, Central America.

BY ISAAC LEA.

In the "Proceedings of the Acad. of Nat. Sci.," April, 1856, I described a new species of *Triqueta* (*Hyria* Lam.), which I called *lanceolata*. It was made from a single valve in a collection from China. In the diagnosis made in the Proceedings it was not mentioned that this valve was somewhat twisted, being fearful that the curved condition arose from accidental circumstances, and not from a normal condition like *Arca tortuosa*, Lin. Subsequently, in the "Journal of the Academy," vol. iii, and in "Observations on the Genus Unio," vol. vi, I published a full account of this peculiarly interesting species, having received perfect specimens, one of which was well figured. In this paper I thought that, as the original name of *lanceolata*, made from a single imperfect valve, did not apply to the perfect shell, science would be subserved by a descriptive name. I proposed to call it *contorta*, and redescribed it under that name with full remarks and observations. At that time it was the only member of the family *Unionidæ*, which was known not to be *equivalve*. Subsequently, in describing a species of *Spatha*, under the name of *Natalensis*, I mentioned that it was "slightly inequivalve." "Journal Acad. Nat. Sci.," vol. vi, and in "Observations on the Genus Unio," vol. xi.

In 1865 I published in the "Proceedings of the Academy" the diagnosis of a new *Unio* from China, which is *inequivalve* and twisted. This I named *tortuosus*. The full description and figure, with remarks, is in a paper which I have prepared for the Journal of the Academy. These constitute all the *inequivalve* species of the family which I have seen until recently.

The collection made by the late Mr. Thomas Bridges, botanist, who, during his travels in Central America, visited Lake Nicaragua, has been kindly placed in my possession, part by Col. E. Jewett, and part by Mr. W. M. Gabb, Palæontologist of the California Geological Survey. Very much to my surprise and satisfaction I found that several species of *Unio* and *Anodonta* had this *inequivalve* character.

It may be here remarked that there seems to be a predisposition, in the *Unionidæ* of Central America, to this very unusual character in the *Unionidæ*, while in Mexico, United States and Canada, where so many species have been described, there has not been a single one observed. These observations and the following list will, I hope, induce more attention to the investigation, by students of Fresh-water *Molluscs*, of this interesting branch of inquiry.

List of inequivalve Unionidæ.

Triquetra contorta, China.
Spatha Natalensis, Africa.
Unio tortuosus, China.
Unio Newcombianus, Cent. America.
Unio Gabbianus, Central America.
Unio encarpus, Central America.
Unio Nicaraguensis, Central America.
Anodonta inæquivalva, Cent. Amer.
Anodonta Granadensis, Cent. Amer.
Anodonta lenticularis, Cent. Amer.

Unio Nicaraguensis.—Testa sulcata, triangulari, compressa, aliquanto *inæquivalva*, inæquilaterali, postice obtuse angulata, antice oblique truncata; valvulis crassiusculis; natibus prominentibus, subacutis; epidermide olivacea, crebris sulcatis indutis, eradiata; dentibus cardinalibus erectis, compressis, crenulatis et in valvulo dextro tripartitibus; lateralibus brevibus fonicatisque; margarita argentea et iridescente.

Habitat.—Lake Nicaragua, Central America. Mr W. M. Gabb.

Unio Granadensis.—Testa sulcata, elliptica, subinflata, inæquilaterali, postice subangulari, antice rotundata; valvulis crassiusculis, antice crassioribus; natibus subprominentibus; epidermide tenebroso-fusca, nigricanti, eradiata; dentibus cardinalibus parviusculis, compressis, erectis crenulatisque; margarita alba et iridescente.

Hab.—Lake Nicaragua, Cent. Amer. Col. E. Jewett and Mr. W. M. Gabb.

Unio encarpus.—Testa sulcata, subtriangulari, subinflata, aliquanto *inæquivalva*, inæquilaterali, postice obtuse angulata, antice rotundata; valvulis subcrassis, antice crassioribus; natibus prominentibus; epidermide tenebroso-olivacea, encarpiformi, eradiata; dentibus cardinalibus compressis, erectis, crenulatis, in valvulo dextro subtripartitibus; lateralibus obliquis rectisque; margarita albida et iridescente.

Hab.—Lake Nicaragua. Mr. W. M. Gabb.

Unio Gabbianus.—Testa sulcata, triangulata, subinflata, aliquanto *inæquivalva*, inæquilaterali, postice triangulari, antice oblique truncata; valvulis crassiusculis, antice aliquanto crassioribus; natibus prominentibus, ad apices retusis; epidermide tenebroso-olivacea, obsolete radiata; dentibus cardinalibus erectis, compressis et valde crenulatis; lateralibus curtis, obliquis striatisque; margarita argentea et iridescente.

Hab.—Lake Nicaragua, Cent. Amer. Col. E. Jewett and Mr. W. M. Gabb.

Anodonta Bridgesii.—Testa lævi, oblonga, inflata, inæquilaterali, antice et postice rotundata; valvulis pertenuibus; natibus prominulis; epidermide lævissima, micanti, olivacea, obsolete radiata; margarita elegantissime iridescente.

Hab.—Lake Nicaragua, Cent. Amer. Mr. Thomas Bridges.

Anodonta inæquivalva.—Testa lævi, obovata, compressa, *inæquivalva*, inæquilaterali, antice et postice rotundata; valvulis subtenuibus; natibus subprominentibus; epidermide vel luteo-viridi vel tenebroso-viridi, obsolete radiata; margarita cæruleo-alba et valde iridescente.

Hab.—Lake Nicaragua, Cent. Amer. Mr. W. M. Gabb.

Anodonta Jewettiana.—Testa lævi, suboblonga, valde inflata, inæquilaterali, postice rotundata, antice oblique rotundata; valvulis tenuibus; natibus prominentibus, inflatis; epidermide olivacea, transverse striata fere sulcata, obsolete radiata; margarita argentea et valde iridescente.

Hab.—Lake Nicaragua, Cent. Amer. Col. E. Jewett.

Anodonta lenticularis.—Testa lævi, subrotunda, compressa, *inæquivalva*, inæquilaterali, antice et postice rotundata; valvulis subtenuibus; natibus prominulis; epidermide transverse striata, tenebroso-viridi, redundater radiata; margarita cæruleo-alba et valde iridescente.

Hab.—Lake Nicaragua, Cent. Amer. Mr. W. M. Gabb.

Anodonta Granadensis.—Testa lævi, elliptica, subinflata, *inæquivalva*, inæquilaterali, postice obtuse angulata, antice rotunda; valvulis subtenuibus; natibus prominulis; epidermide vel lutea vel viridi-radiata; margarita cæruleo-alba et valde iridescente.

Hab.—Lake Nicaragua, Cent. Amer. Col. E. Jewett.

An Examination of the REPTILIA and BATRACHIA obtained by the Orton Expedition to Equador and the Upper Amazon, with notes on other Species.

BY E. D. COPE.

The expedition for purposes of scientific exploration, to which the present paper relates, was undertaken during the autumn and winter of 1867—8, under the auspices of the Smithsonian Institution. Prof. James Orton, of Williams College, Massachusetts, directed the expedition, which was composed mainly of students of the same institution. This enterprise, particularly worthy of a popular institution of learning of the grade and position which an American College ought to occupy, has been attended with success in many departments of natural and physical sciences. In the present department, valuable in furnishing a reliable key to the history of the mode of creation and distribution of animal life, a considerable amount of material has been collected, which is reviewed summarily in the following pages.

The party divided, a portion ascending the Orinoco River to meet the other portion in Eastern Equador. The course of the latter was as follows, as I am informed by Prof. Orton:

They first touched the continent at Payta, Peru, and afterwards at Guayaquil; then proceeded inland over the Andes to Quito—collecting in the valley about three months; thence via Pafallacta (on the east slope of the eastern Cordillera) and Archiaona (the largest town in the Oriental part of Equador,) to Napo on the River Napo; thence by canoe down the Napo to the Maranon and Amazons.

They collected Reptiles chiefly from Guayaquil, Pallatanga (on the west slope of the western Cordillera south of Chimborazo); Ambato (in Valley of Quito); western slope of the volcano Antisana, 13000 ft. above sea (a small black frog;) Archiaona—in the depths of the Napo forest (lizards chiefly;) Santa Rosa on the Napo (lizards chiefly;) Pebas, Peru, on the Maranon—2200 miles from the Atlantic (snakes chiefly,) and Tabatinga on the Brazilian frontier, (snakes chiefly.)

CROCODILIA.

Crocodilus americanus Linn. *C. acutus* Cuv.

From Guayaquil.

TESTUDINATA.

Testudo elephantopus, Harlan.

From Guayaquil, identical with sp. from the Gallapagos Islands. This species presents the broad posterior vertebral shield of the American T. tabulata and polyphemus.

Chelydra serpentina Linn. Schweigger.

One sp. from Guayaquil, identical with nearctic specimens. This species furnishes a case of distribution unparalleled among reptiles, ranging as it does from the cold regions of Canada to the torrid region of Equador. Peters has already noticed Guayaquil as its most southern habitat, via. Monatsber., Berlin Ac. 1862, p. 627.